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Ecological Observations on Erebia (Lepidoptera: Satyridae) in Northwestern America [1]

By PAUL R. EHRLICH [2]

With the exception of a few short notes (Freeman, 1948; Ehrlich, 1954) little has been published on the habits or habitats of northern *Erebia*. This lack of information for the relatively uniform stretches of the eastern tundra and taiga is unfortunate; however, the absence of ecological data in association with specimens from montane regions in the Northwest is a serious problem to those attempting zoogeographic or evolutionary studies of this genus in North America. This problem is, of course, common to most workers studying boreal insects. Many specimens bear limited data such as "McKinley Park, Alaska." This means the individual was taken somewhere in an area half again as large as Delaware, between the altitudes of 1800 and 20,300 feet, in a habitat reminiscent of somewhere between northern Maine and the North Pole.

This study is an attempt to rectify this unfortunate situation. It is based on a survey conducted in 1955 in northern British Columbia, southwestern Yukon Territory, and east-central Alaska. Specifically the localities studied were along the Alaska ("Alcan") Highway in British Columbia, Yukon Territory, and Alaska; the Steese and Taylor Highways of Alaska; the Denali Highway in Mt. McKinley National Park, Alaska; and the Dawson Road, running from the Taylor Highway in Alaska to Dawson, Yukon Territory.

[1] This investigation was supported in part by a Sigma Xi-Resa Grant-in-aid.

[2] Contribution No. 912 from Department of Entomology, University of Kansas, Lawrence.

All collecting along the Alaska Highway was done in Canadian Zone situations. The road runs through seemingly endless stretches of the northern coniferous forest, which is broken by intermittent secondary growths of birch, poplar and willow. Pines tend to give way to spruce as one proceeds northward. Even as early as June 12 roadside bogs were found to be dried out, and most of the length of the highway offered poor collecting, apparently because of the dryness.

Collecting on the Steese Highway (which runs northeast from Fairbanks to Circle, Alaska, just south of the Arctic Circle on the Yukon River) was done principally on and around Eagle Summit (one of several places where the road goes above tree-line), which reaches an altitude of some 4000 feet.[3] Tree-line in the vicinity of the summit is around 3400 feet, above which in many areas there are growths of dwarf birch before the beginning of the more typical tundra areas.

The Taylor Highway runs from Tetlin (or Dawson) Junction (mile 1306, Alaska Highway)[4] 156 miles north to Eagle, Alaska. This road was traveled to mile 99.5, the junction with the Dawson Road. It goes through rolling country, principally Canadian Zone, into the "Forty-mile" country, where gold was found in 1898. From this general area Holland described a number of butterflies (including *Erebia youngi* from "Mts. between Forty Mile and Mission Creek" and *E. theano alaskensis* from "Eagle City and American Creek") based on material collected by S. Hall Young. Unlike the Taylor Highway the Dawson Road, running east 76.5 miles to Dawson City, Yukon Territory, remains almost continually above tree-line, which is about 3,500–3,700 feet in this area.

Mount McKinley National Park lies principally above tree-line, although there are heavily wooded areas (mainly white spruce) in the river valleys and in the extreme eastern part of

[3] All altitudes referred to in this paper were estimated by using an automobile altimeter and/or topographic maps, and are doubtless subject to a ± 100 foot error in many places. However, in any one area they are accurate for comparative purposes.

[4] Mileages are mostly from "The Milepost," 1955 edition, edited by Wm. A. Wallace, an invaluable guide to the northwestern road systems.

the park in the vicinity of the hotel. Tree-line is variable, sometimes going slightly above 3,000 feet and sometimes slightly below 2,000 feet. Ecological classification becames quite difficult in localities such as Wonder Lake, where there are large areas of "tundra" meadow interspersed with stands of spruce. Readers interested in more information on the park area are referred to Murie (1944), who gives detailed descriptions, photographs, and a bibliography.

A summary of collection records and habitat information on each species of *Erebia* collected follows.

Erebia disa Thunberg (*E. d. mancina* Westwood, *E. d. subarctica* McDunnough). Alaska Highway: Muncho Lake, miles 456–460, B. C., 2500′, VI-14; Mile 1105, nr. Kluane Lake, Y.T., 2500′, VI-19; Mile 1270.5, nr. Northway Junction, Alaska, 1800′, VI-20; Mile 1316, W. of Tok Junction, 1800′, VI-20; Four miles E. of Fairbanks, Alaska, approx. 600′, VI-21. Steese Highway: North slope of Eagle Summit, nr. mile 110, 3500′, VI-24. Mt. McKinley National Park: Wonder Lake, approx. 1900′, VII-2. Taylor Highway: Mile 43, 2100′, VII-9. (87 specimens taken.)

This was the first *Erebia* encountered on the survey. It and *discoidalis* apparently share the honors for being the species with the earliest flight period. Local information at Muncho Lake would indicate that the season was 5–8 days late; thus the fresh material taken on June 14 would indicate normal first emergence around June 7. Wherever it occurred *disa* appeared to be associated with spruce forest. However, individual specimens would be encountered in open situations, flying across roads or in sedge marshes. A single specimen was taken on the road at tree-line on Eagle Summit, but it was flying out of a growth of stunted spruce. Near Wonder Lake, where tundra and heavy stands of spruce interdigitate between the altitudes of 1700 and 2000′ *disa* occurred commonly in the open areas along with *E. youngi* and *E. rossii*, and was even more abundant in the spruce forest where the other two species were reduced in numbers or absent. The butterfly with which *disa* was most frequently associated was *Oeneis jutta* Huebner, with which it

occurred both in spruce bogs and spruce marshes. At mile 1316 *disa* was taken in considerable numbers while sucking moisture from damp areas in a road through the spruce woods. Many of the imbibing individuals were lethargic (intoxicated?) and would fly only when prodded. At Wonder Lake many *disa* were observed congregated at puddles and damp spots.

Erebia discoidalis Kirby (*E. d. mcdunnoughi* dos Passos). Alaska Highway: Mile 1105; Mile 1428, 1 mile E. of Big Delta, 1400′, VI-20; Four miles E. of Fairbanks. Steese Highway: Mile 102, Ptarmigan Creek, just S. of Eagle Summit, 2500′, VI-23-24; Mile 111, N. slope of Eagle Summit, approx. 3200′, VI-24; Mile 94, Twelvemile Creek, 2700′, VI-24. McKinley Park: Opposite Muldrow Glacier along Highway, 2800′, VII-1; Wonder Lake. (When the data given are incomplete they are identical with the previous reference to the locality.) (71 specimens taken.)

E. discoidalis appeared to occupy the same geographical and altitudinal range as *disa* in the area studied. However, it is an insect of open, dry, grassy areas. Occasional specimens were taken at or above tree-line (opposite Muldrow Glacier, Wonder Lake) but it is definitely not a tundra species.

Erebia rossii Curtis (*E. r. gabrieli* dos Passos). Steese Highway: Mile 102. McKinley Park: Teklanika River, 2650′, VI-26-VII-4; West slope of Polychrome Pass, 3000′ and 3400′, VI-27; Three miles E. of Teklanika River, 2800′, VI-28; Summit, Polychrome Pass, 3700′, VII-1; E. of Toklat River, 3200′, VII-1; Opposite Muldrow Glacier; Wonder Lake. Dawson Road: Four miles W. of (Alaska-Yukon) Border, 3000′, VII-9. (63 specimens taken.)

Erebia rossii has long been popularly pictured as a butterfly of the far arctic. Cadbury (1938) with a typical *rossii* before him taken at 5200′ in northern British Columbia (Caribou Pass) consumes two pages trying to demonstrate that the specimen is actually *disa*. Ehrlich (1952) infers that tree-line forms a barrier to the distribution of *rossii*. It now becomes apparent that at least in some areas *rossii* is able to thrive in the taiga as well as the tundra. The vast majority of *rossii* collected in Alaska

by the author were taken below tree-line. It was plentiful along the highway in the valley of the Teklanika River, in a heavily wooded area which supports a small moose population. It occurred with *disa,* visiting moisture in large numbers around treeline at Wonder Lake, and the single specimen taken on the Steese Highway was captured at 2500′ flying with *Erebia discoidalis, Papilio machaon* L., and *Pieris napi* L. *E. rossii* is definitely not a straggler in these lowland areas, for it was found constantly in good numbers, flying leisurely, in condition indicating recent emergence. There was no indication of climatic factors (wind, cold) forcing them to the lower levels.

Erebia fasciata Butler (*E. f. fasciata* Butler). Steese Highway: Mile 109, Eagle Summit, 3880′, VI-23. McKinley Park: Summit, Polychrome Pass; West slope of Polychrome Pass, 3400′; W. of Polychrome Pass, about 3000′, VII-1; East slope of Sable Pass, 3800′, VII-1; Summit, Sable Pass, 3900′, VII-1; E. of Toklat River, 3200′, VII-1; Wonder Lake. Dawson Road: One mile W. of Border, 4200′, VII-9; Four miles E. of border, 3800′, VII-9. (68 specimens taken.)

Erebia fasciata was the one species studied which appeared to be largely restricted to a true "arctic" habitat. It was found almost exclusively in moist grassy tundra situations, above tree-line. It did not fly over the stands of dwarf birch and willow or over the high dry tundra, which make up the principal alternative above tree-line habitats. Individuals were most frequent in very moist areas, often in depressions carrying off water from large late-melting snowdrifts. *In no case was fasciata found in open areas within forest growth.*

Erebia youngi Holland (*E. y. youngi* Holland, *E. y. rileyi* dos Passos). Steese Highway: North slope of Eagle Summit, nr. mile 110, 3500′, VI-24. McKinley National Park: West slope of Polychrome Pass, about 3000′, VI-27; E. of Toklat River, 3200′, VII-1; Toklat River, 2700′, VII-1; Stony Mt., 4000′, VII-1; Summit, Polychrome Pass; Opposite Muldrow Glacier; Wonder Lake. Dawson Road: One mile W. of Border; Four miles E. of Border. (52 specimens taken.)

Erebia youngi showed a wider range of habitat preference than *fasciata,* although it was more restricted than *rossii.* On Eagle Summit it was found only in an area of dry tundra mixed with patches of dwarf birch just above tree-line. In McKinley Park it ranged more widely, being taken along the highway in the wooded Toklat River Valley and also high on the dry, *Dryas*-covered tundra slopes. At Wonder Lake it was not taken in timbered areas, but mingled with *disa* and *rossii* around damp areas in the road. It was not recorded from the relatively heavily wooded Teklanika River Valley, which was the most thoroughly collected locality in the park. In the high altitude areas on the Dawson Road *youngi* flew in the general vicinity of *fasciata* but showed a definite preference for drier areas.

Erebia theano Tauscher (*E. t. alaskensis* Holland). McKinley Park: Toklat River; Wonder Lake; Teklanika River, VII-3; Horseshoe Lake Trail, nr. Hotel, about 1800′, VII-4. Taylor Highway: Mile 88, 1700′, VII-9. (24 specimens taken.)

Erebia theano was extremely local in its distribution. It was taken in good numbers only in and around a spruce bog on the Taylor Highway. It seems likely that *theano* was just beginning to emerge when the author was in McKinley Park and would probably have been much more abundant later. It was always taken in wooded areas.

Erebia epipsodea Butler (*E. e. remingtoni* Ehrlich). Taylor Highway: Mile 88. Dawson Road: Four miles W. of Border, 3000′, VII-9. (4 specimens taken.)

Unfortunately time did not permit extensive work on *epipsodea* and nothing of significance was discovered to add to Bruggemann's remarks (*see* Ehrlich, 1955, p. 182). It is interesting to note, however, that *epipsodea* and *rossii* fly together along the Dawson Road west of the border.

Erebia mackinleyensis Gunder. (*E. magdalena mackinleyensis* Gunder?)

A diligent search for this insect was carried out in McKinley National Park, including localities ranging from rock-slides at over 4000′ to heavily wooded areas well below 2000′. No sign

of *mackinleyensis* was seen. Aside from the possibility that it is exceptionally local, or that it is only common in alternate years, no explanation can be offered for its absence.

The flight periods of the *Erebia* studied start long before the brief northern summer has gotten into full swing. This would appear to be a device to permit the larvae a maximum period to feed, whether the life cycle requires one or two seasons. It seems likely that the species over-winter as pupae or as mature larvae. Life history studies are badly needed.

It is possible for one familiar with them to identify many of the species on the wing. *E. fasciata* and *rossii* are fairly easily confused, but the former is a faintly less vigorous flier. *E. youngi* is normally smaller than the aforementioned and a faster flier than either. *E. rossii* appears extremely dark in flight and prefers open areas when in the vicinity of woods. *Disa* is lighter in appearance and will be seen flitting in and out among the trees. *E. discoidalis* appears smaller and lighter than either *disa* or *rossii* and stays in the open. After collecting the other species, *theano* seems to be a miniature, bouncing along slowly in a bog like a big, dark, female *Plebejus*. In the limited time spent observing northern *epipsodea* no difference was seen between them and *rossii*. *E. fasciata, rossii* and *youngi,* especially the first two, were quick to use the tundra butterfly's favorite tactic when disturbed—flying straight up, to be carried away by the wind.

No predation of any sort was observed, although one specimen of *fasciata* bore the marks of a possible avian attack. Rodents probably take some toll of adults, but it seems likely that the major factors controlling *Erebia* populations operate on the immature stages. Although predation and parasitism doubtlessly exercise some influence here, climatic factors (amount of cold, snow cover, temperature fluctuations, rapidity of runoff, amount of spring flooding of habitat) would appear to be much more important.

It is interesting to speculate on the limiting factors in the distribution of the various *Erebia* species. Does *rossii* follow its foodplant into the taiga, while *fasciata* is restricted to some

plant which does not reach as far south as the tree-line at Churchill, Manitoba? Is *fasciata* so finely adjusted by selection to the rigors of a strict tundra existence that it cannot compete in the taiga? Is interspecific competition ever a limiting factor (Gause's principle)? Is the difference in length of day a barrier in preventing the southward extension of arctic species in alpine areas? It seems likely that two factors are very important—the distribution of food plants and the lack of time for post-glacial immigrants to colonize suitable areas.

Thanks go to Dr. and Mrs. Floyd W. Preston of Lawrence, Kansas, who were of extensive assistance in the field.

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An Extension of Range for the Ant, Pheidole lamia Wheeler (Hymenoptera: Formicidae)

By Robert E. Gregg, Department of Biology, University of Colorado

Additional geographic data for well-known and wide-spread species are usually of minor significance, but in the instance herewith reported the situation is otherwise. *Pheidole lamia* was described from Austin, Travis County, Texas, by Wheeler (1901), and was redescribed by him also in 1908. Very little is known about the habits of this species, but according to Wheeler, the ant is hypogaeic, living under stones in small colonies. Several nests were taken, and contained from one to four soldiers each. Wheeler suggested, on account of the large size of the gaster and the small numbers of the soldiers, that this caste may function as the queen, but this seems to be an entirely gratuitous assumption considering the very meagre data available. Many other species of *Pheidole*, which possess queens, exist only as small colonies with but a few soldiers in the nest.

The most striking feature of this ant is the phragmotic head of the soldier or major caste, which Wheeler believes is used for plugging the entrances to the nest galleries. He bases this judgment on the obviously convergent resemblance of the head of *lamia* to that of the formicine subgenus, *Colobopsis*, in which the head of the major is markedly phragmotic and known to be employed for closing the door of the ant nest. Some interesting discoveries concerning the ecology of *Pheidole lamia* await the investigator who receives the opportunity to observe this species in the field and in captive laboratory colonies.

Wheeler is doubtless correct in his interpretation of the function of the head of the *lamia* major, but actual observation of the living ants has been exceedingly difficult owing to their extreme rarity. Dr. W. S. Creighton has informed me that he spent a great deal of time and effort searching for the species in the type locality, but without any success. However, the ant has turned up in two other localities, and we now have some

conception of the pattern of its distribution. Dr. M. R. Smith reported in 1931 that a colony which yielded two soldiers and a number of workers was collected at Fayette, in Jefferson County, Mississippi. This station is approximately twenty miles east of the Mississippi River. No ecological information is supplied other than that the nest was situated at the base of a maple tree. The other record is the latest one known to me and comes from the state of Georgia. Several months ago, Mr. Paul B. Kannowski sent me numerous specimens of *Pheidole* from the southeast, and included among them a sample of *Ph. lamia*. The ants were collected by him on May 27, 1954, and were secured in District 21 of Decatur County, Georgia, approximately one mile north of the town of Chattahoochee, Florida. There are two majors and ten minors in the series. This locality needs some clarification to avoid possible future confusion over the name of the nearby town. The collection was made in the extreme southwestern corner of Decatur County and of the state of Georgia, just over the state line from Chattahoochee, Florida. This should not be confounded with Chattahoochee, Georgia, which is located in the northern part of that state in Fulton County, near Atlanta.

Though only three stations are thus far recorded for *Ph. lamia*, they are sufficiently separated geographically to permit us to visualize the probable range of the species. Its distribution may be seen to correlate pretty well with the Gulf strip of the Lower Austral Zone, at least as far as the Mississippi and Georgia records show. Austin, Texas is a bit too far inland to be included in the Gulf strip although it is not very much removed from the somewhat arbitrary boundary of this strip. Detailed data concerning the vegetation of the three localities has not been furnished, but from what is known of the general plant cover of these sections of the United States, it is safe to assume that the ants were nesting either in moist deciduous forest or in deciduous-coniferous woodland. In the vicinity of Austin, it is probable the nests were taken in oak-hickory groves. While it is possible the ants may have established themselves in areas of disturbed vegetation, it seems more likely they were

under natural plant growth, or stands showing relatively little disturbance. This is inferred partly from the fact that *lamia* is such a rare ant.

Future collecting in the southern and southeastern borders of the country may give us much needed additional knowledge with respect to the macro- and the micro-ecology of this ant and also of its zoögeography. It should occur in Florida, the coastal areas of Alabama, Mississippi, Louisiana, and Texas, and possibly along the coast into Tamaulipas, Mexico. It would not be surprising if it were discovered eventually nesting at more inland sites of these same states, and extending perhaps through Georgia into South Carolina.

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Two New Species of Lopidea Uhler from Illinois (Hemiptera, Miridae) [1]

By THOMAS E. MOORE, Illinois Natural History Survey, Urbana

The species described in this paper have some unusual interest in that they both were collected from the same plant, a little more than a month apart. The first specimen of *L. chandleri* was collected in mid-May, and all of the specimens of *L. wisteriae* were obtained from the same cultivated Wisteria vine in early July. This is not the first time that such an occurrence has been recorded for this genus, for in 1918 H. H. Knight described two species of *Lopidea* from Arizona associated together on *Robinia neomexicana*. However, it is not

[1] This paper is a joint contribution from the Section of Faunistic Surveys and Insect Identification, Illinois Natural History Survey, and the Department of Entomology, University of Illinois.

clear from the literature whether or not both species occurred on the same plant specimen, as in the case at hand.

Several species of *Lopidea* are known to feed on members of the Leguminosae, but these are the first records of any on the genus *Wisteria*. Males of both of these species will key to couplet 9 in the "Key to Species" for *Lopidea*, pages 84–87, Knight (1941).

Lopidea chandleri new species

Closely related to *L. amorphae* Knight and *L. reuteri* Knight, but distinguishable on the basis of characters in the male genitalia.

Male.—Size subequal to that of *L. reuteri;* each antenna reddish-black with short black pubescence; compound eyes red; head red with inverted "V" on front and dorsal basal transverse band black; tylus and rostrum black; pronotum red with broad black apical transverse band; scutellum fuscous-red; each hemelytron red with apical half of clavus infuscated and membrane black; legs reddish-black; venter of abdomen red except for blackish ninth segment; genital structures distinctive as illustrated.

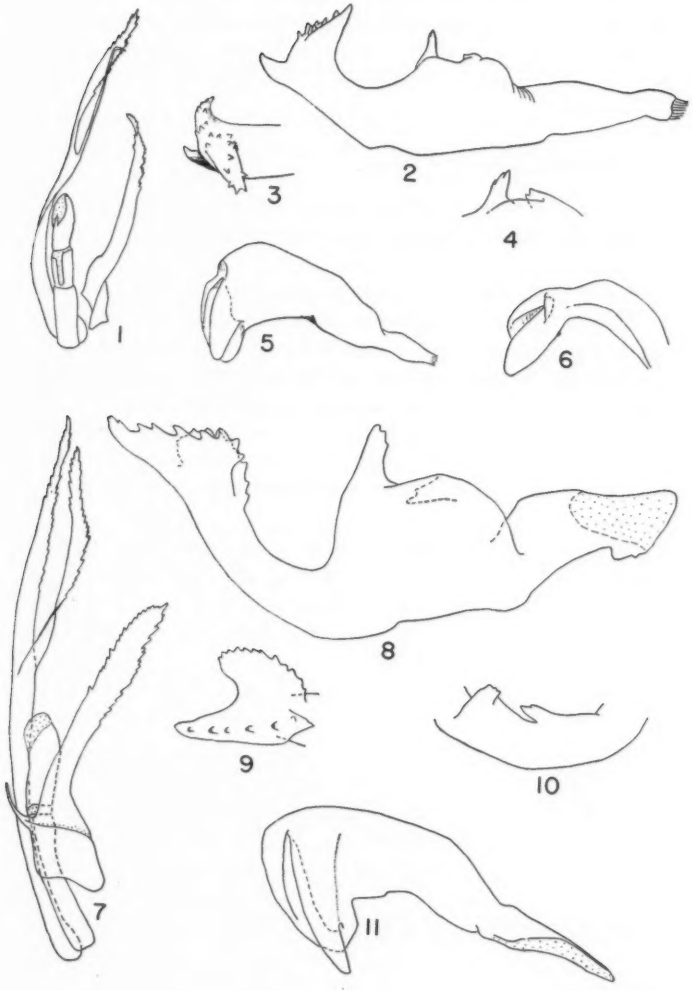
Female.—More robust than male: coloration similar to male, but dark markings more extensive and generally darker in contrast; abdomen red with black around ovipositor on segments 6 and 7, most of sternum of 8 and all of sternum of 9 and third valvulae black.

Holotype: ♂, Carbondale, ILLINOIS, May 28, 1955, S. C. Chandler, on Wisteria vine.

EXPLANATION OF FIGURES

Lopidea chandleri new species, male. Fig. 1, apex of aedeagus and vesica appendages; fig. 2, right gonoforcep, outer lateral aspect; fig. 3, apex of right gonoforcep, oblique inner aspect; fig. 4, sensory lobe of right gonoforcep, dorsal aspect; fig. 5, left gonoforcep, inner lateral aspect; fig. 6, apex of left gonoforcep, dorsal aspect.

Lopidea wisteriae new species, male. Fig. 7, apex of aedeagus and vesica appendages; fig. 8, right gonoforcep, outer lateral aspect; fig. 9, apex of right gonoforcep, dorsal aspect; fig. 10, sensory lobe of right gonoforcep, dorsal aspect; fig. 11, left gonoforcep, inner lateral aspect.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Paratypes: Same data as for holotype, 3 ♀; Carbondale, Illinois, May 18, 1955, S. C. Chandler, on Wisteria vine, 1 ♂ (teneral). All types deposited with the Illinois Natural History Survey. This species is named for the collector, Mr. Stewart C. Chandler.

Lopidea wisteriae new species

As with the above species, closely related to *L. amorphae* and *L. reuteri,* but separated by means of male genital characters.

Male.—Size subequal to that of *L. reuteri;* coloration as in *L. chandleri* with the following exceptions: Head with a broad black stripe at each side of the front between antennae; pronotum with infuscated broad apical transverse band and fuscous inverted "V" above scutellum; scutellum darker; each hemelytron with clavus and inner half of corium generally infuscated; femora more reddish; abdomen with ninth segment somewhat infuscated; genital structures distinctive as illustrated.

Female.—Slightly larger and more robust than male; coloration similar to male; venter of abdomen red with black around ovipositor on segments 6 and 7, segment 8 black near ovipositor and on apical margin, 9 black on basal and apical margins with disc reddish, third valvulae black.

Holotype: ♂, Carbondale, ILLINOIS, July 7, 1955, H. H. Ross and T. E. Moore, on Wisteria vine. Deposited at the Illinois Natural History Survey.

Paratypes: Same data as for holotype, 19 ♂, 12 ♀. Specimens deposited with the Illinois Natural History Survey, the U. S. National Museum, and the British Museum (Natural History).

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Some Notes on Boreal American Stagbeetles (Coleoptera: Lucanidae)

By Bernard Benesh, Burrville, Tennessee

The present contribution is a partial review of a article by E. Séguy, entitled "Notes sur les Coléoptères Lucanides," published in the Revue française d'Entomologie, XXII (1) 1955, pp. 32–42.

I am deeply grateful to Monsieur Melchior de Lisle, directeur des travaux publics, Douala, Cameroun francaise, for notifying me promptly of the appearance of above mentioned article; to M. E. Phillips for his interest in the matter, and am especially thankful to the Librarian of the Academy of Natural Sciences, Mrs. Venia T. Phillips, who was instrumental in making the Revue available for study and transcription. My heartiest thanks to all.

Lucanus placidus Say

In the "Catalogue illustré des Lucanides du Globe," a joint contribution of Didier and Séguy (1953), but apparently the work of the junior author, appears the following note: "Il est évident que le nom: *Lucanus lentus* Castelnau a la priorité." This suggested synonymy is given a more positive status by the definite assertion of Séguy (1955: 32): "Le nom impose à cette espèce par Castelnau a la priorité sur celui de *placidus* Say 1865."

The source of above indicated synonymy, not given by Séguy, is evidently the data appearing in van Roon's (1910:9) Lucanidae section of the Coleopterorum Catalogus, which Séguy, without verification, accepts as correct and valid, recording it verbatim. Such procedure should be condemned, and a man is justified in wondering whether this is actually the "travail scientifique" alluded to by Séguy (1953: 59), in his criticism of Arrow's actions.

It is surprising that Séguy had erred on such a simple problem as the priority of *placidus*. A reference to any one of the

contemporary bibliographies, such as the Horn and Schenkling's Index Litteraturae Entomologicae, would have supplied the data sought. A glance into the Index Litteraturae should have sufficed, and disclosed that Thomas Say died 10, X, 1834, and consequently could not have had anything published in 1865! Another, much more readily available publication, is the Leng's Catalogue of Coleoptera of America, North of Mexico, published by John Sherman, Jr., Mount Vernon, N. Y. In this publication Séguy would readily discover that *placidus* Say is followed by the figures 25–202, the first number relating to the year of issue, the figure after the hyphen referring to the page; in the bibliography, under Say, the number 25 indicates 1825, and the pertaining publication fully given as Journ. Acad. Nat. Sci., Phila., V, pp. 160–204, which, of course, includes page 202. We offer this lengthy explanation in a cooperative spirit, in the hope that it will be useful to other workers to acquaint themselves with the bibliography, which in some instances appears to be overlooked and even neglected.

Lucanus placidus was described by Thomas Say in "Descriptions of new species of Coleopterous Insects inhabiting the United States," Journal of the Academy of Natural Sciences, Philadelphia, volume V, 1825, p. 202, and not as given by Séguy in 1865. The second reference to the species appears in LeConte's edition (1859) of Say's Entomology, vol. ii, page 302, with this remark: "(Appears to be the female *L. lentus*, a species cited from Say, but of which, as Burmeister observes, no description can be found in his writings; it was first published under that name by Laporte, in his Hist. Nat. 2, 71 (should be p. 171, B. B.). The name *placidus* has greatly the priority.—LeC.)."

Burmeister's reference (Handbuch der Entomologie, Band V, 1847, p. 357), mentioned by LeConte, is the following: "Anm. In den mir zugänglichen Schriften von Th. Say finde ich keinen *L. lentus* beschrieben. Die Art scheint übrigens in grösseren Exemplaren vorzukommen, insofern die 3, welche ich vor mir habe, schon von 14–18‴ differiren und mehr den Eindruck verkümmerter Individuen auf mich machen."

We are confident that the foregoing will readily expunge the illusory synonymy, and consign *L. lentus* Castelnau into synonymy, where it rightfully belongs.

The references pertaining to *L. placidus* and its synonym *lentus* in the "Catalogue illustré" are incomplete, the following having been omitted: LeConte, Say's Ent. (1859), II, p. 302; Fuchs, Bull. Brooklyn Ent. Soc., V, 1882, p. 51, where a figure is given of the species, but erroneously designated as *L. mazama* LeConte; Wickham, Canad. Ent., xxxi, 1899, p. 22; Blatchley, Coleoptera of Indiana, 1910. p. 906; Horn, Trans. Amer. Ent. Soc., v, 1875, p. 137; Heyne und Taschenberg, Die Exotischen Käfer in Wort und Bild, 1908, p. 50 (according to Blackwelder (1949) the Lucanidae Heft was issued in 1897), the last two citations pertaining to *lentus*.

Dorcus caucasicus Ganglbauer

In note 86, Didier and Séguy (1953: 52) state: "Cet insecte provient de Californie (cf. Bedel, Faune, IV, 1911, p. 9, note 3)."

A reference to Leng's Catalogue, cited previously, should convince Séguy that the genus *Dorcus*, in Boreal America, is represented by two valid species, both ranging east of the Rocky Mountains, and their distribution carefully plotted by Benesh (1937). *D. caucasicus* was described by Ganglbauer (1886) from the vicinity of Nucha, Caucasus; the correctness of the locality is doubtful, as Reitter (1892) denies it, stating: "Described erroneously from Caucasus, its origin is California." Reitter's contribution, the well-known "Bestimmungs-Tabellen," was translated into the French language by E. Barthe and published in Miscellanea Entomologica, xii, ?1893, where it is stated: "Décrit par erreur du Caucase, est originaire de Californie." It is from the latter publication Bedel copied the information anent *D. caucasicus*, adopting it as his own, omitting to give credit where due, a plagiarism in its ugliest form to be used by a scientist, and recorded, without verification, by Didier and Séguy, as cited above. While there is no valid reason to

excuse the first, some extenuation can be shown to the last (Didier and Séguy), who may be excused, for their apparent ignorance of the entire matter. However, if they were cognizant of the evidence, recording it as Bedel had done, then they are as guilty as Bedel, and would deserve severest censure. Hence to correct the citation, instead of Bedel, it will be precise to record the original: Reitter, Abh. Nat. Ver., Brünn, xxx, 1892, in which periodical the Bestimmungs-Tabellen 24, Lucaniden und coprophage Lamellicornen, were issued, in installments, from 1892 to 1897.

According to the description, *Dorcus caucasicus* is a small female, 15 mm. long, which was definitively assigned by Benesh as a synonym of *D. brevis* (Say), and is so recorded in the forthcoming second edition of the Lucanidae part, Coleopterorum Catalogus.

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A New Texas Agrilus with Notes on Chalcophorella (Coleoptera: Buprestidae)

By Josef N. Knull, Department of Zoology and Entomology, The Ohio State University

The following paper is the result of further studies of North American Buprestidae.

Agrilus chisosanus n. sp.

Female.—Dorsal and ventral surfaces shining reddish cupreous; lateral depressions of pronotum, a stripe on each elytron, ventral portion of prothorax, sides of meso- and metathorax and vertical portions of first two abdominal segments with recumbent white pubescence.

Head convex, with shallow median depression; surface finely rugose; antennae short, reaching to about middle of pronotum when laid along side, serrate starting with fifth segment.

Pronotum wider than long, widest in front of middle; sides subparallel at base, broadly rounded to apex; when viewed from side marginal and submarginal carinae are separated in front and joined near base; anterior margin strongly sinuate, median lobe broadly rounded; base sinuate with feeble median lobe; disk convex with slight median depression on basal half, lateral depressions well marked, with prehumeral carinae; surface finely transversely striate, punctures fine. Scutellum finely transversely carinate.

Elytra at base narrower than widest part of pronotum; sides subparallel back of base, feebly constricted in front of middle, expanded back of middle, then obliquely narrowed to rounded serrulate apices; disk somewhat flattened, sutural margins elevated back of middle, basal depressions evident; surface imbricate.

Abdomen beneath finely punctate. Prosternal lobe subtruncate in front; prosternal process concave back of coxal cavities. Tarsal claws similar on all feet, cleft, with inner tooth much shorter than outer one and not turned inward.

Length 6.3 mm.; width 1.8 mm.

Holotype female collected in Chisos Mountains, Brewster Co., Texas, July 8, 1955 by D. J. and J. N. Knull and in collection of author.

This species runs to *A. aeneocephalus* Fisher in Fisher's key (1928). It can be separated by the shorter pronotum, finer striations on head and pronotum and lack of short pubescence over dorsal surface.

The well marked pubescent stripe on elytron continuing on lateral depressions of pronotum will aid in separation too.

Chalcophorella langeri (Chev.)

Chalcophora langeri Chev. 1853: 308.

Specimens of what I consider to be this species have been seen from New Orleans, La., Texas and Virginia. The Chevrolet type was from near New Orleans. An examination of the type of *Chalcophorella obsolescens* Csy. (1914) from Louisiana in the U. S. National Museum proves to be same. The species lacks the median broad sulcus of both *C. campestris* (Say) and *C. fulleri* (Horn), and lateral serrations of elytra near apices are nearly obsolete. LeConte (1859) considered *langeri* a valid species. The following key should help separate species of Chalcophorella:

1. Lateral serrations of elytra near apices coarse..... .....*campestris* (Say)
   Lateral serrations of elytra near apices fine.....(2)
2. Pronotum with lateral margins converging from base to apex; median sulcus of pronotum limited to a fine line on a smooth median line.....*langeri* (Chev.)
   Pronotum with lateral margins subparallel near base, then suddenly converging in front of middle; median sulcus of pronotum broad.....*fulleri* (Horn)

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A New Collecting Method: The Oatmeal Trail

By THEODORE H. HUBBELL, Museum of Zoology,
University of Michigan

Night collecting with the aid of an electric head-lamp has become an indispensible technique in the study of nocturnal arthropods (Wallace 1937, Cantrall 1941), and the use of attractant baits in jar-traps or applied to surfaces is well known. Jar-trapping has been the standard method of securing in quantity certain kinds of nocturnally active terrestrial insects, such as camel-crickets, cockroaches, certain carabids and other beetles, and representatives of other orders. It has the great advantage of accumulating specimens without requiring the presence of the collector. Descriptions of the jar-trap method and its modifications have been given by Hubbell (1936), Hubbell and Goff (1940), Cantrall (1941), and Beaudry (1954).

The collecting method here described combines use of the head-lamp with that of bait, and is so effective and so simple that it would be surprising if others have not independently discovered it. I have, however, never encountered any reference to it nor met anyone who had heard of it. My own use of the oatmeal trail technique came about through accident. Encamped with two mammalogists in 1947 on the slopes of Cerro Tancítaro in Michoacán, México, my curiosity was aroused by their complaints that something, presumably insects, was interfering with their catch by eating the bait from and sometimes springing their mouse-traps. That night I followed their trap-lines with my head-lamp, and found swarms of crickets, camel-crickets, carabids, cockroaches and ants feasting on the bait, which consisted principally of oatmeal. As soon as I could obtain a supply of oatmeal (which in Mexico is universally known as "tres minutos") I tried using it alone, and found it nearly as attractive as the bait mixture. Filling the pockets of my hunting jacket with the dry oatmeal, I sifted it out of my hand in a thin trail along a half mile of forest path, about dusk. Returning with head-lamp well after dark, I found the trail of white flakes easy to follow, and was amazed

at the numbers of insects that had congregated along it, together with many phalangids. Nearly all could be caught by a quick pounce of the hand, so engrossed were they in feeding; and in many places they were so numerous that I had no opportunity to rise from a crouching position while slowly advancing along the trail. Many of the beetles, camel-crickets and large ants were caught among the leaves at the sides of the path, hurrying away with a large white flake of oatmeal, or partly hidden under a leaf with the flake protruding to call attention to them. Three trips along the trail at intervals of about an hour yielded several hundred specimens—more than I had obtained in a score of trap-jars left out several nights. By the time the last trip was made most of the oatmeal had disappeared.

Since that first experience the "tres minutos" or oatmeal trail has become for me a standard and highly productive field method. Some of my colleagues and students who have used it have had equal success. Like all methods, it has its limitations and occasional failures; when the insects are not moving about, because of low temperature or humidity or for other reasons, they do not find the oatmeal trail. Sometimes, on the other hand, it yields surprisingly large catches. On September 5, 1952, on a trail along Arrowhead Branch in Macon County, North Carolina, I. J. Cantrall and I collected more than a quart of camel-crickets and other insects, including several hundred *Hadenoecus puteanus* and series of *Ceuthophilus gracilipes, C. uhleri* and *C. pallidipes*. They were taken in about two hours along half a mile of trail. In Ohio, during the fall of 1955, David Eades, a student at the University of Michigan, collected in three weeks by this method several times as many specimens of *Ceuthophilus nigricans* and *C. thomasi* as all those previously known from that state.

Most of the insects collected on the oatmeal trail can be placed directly in alcohol, and later if desired run through xylol for pinning. They have one great superiority over specimens collected in the conventional molasses trap, in that they are not coated with and have swallowed no molasses. Unless all molasses is removed from trapped specimens before pinning they become discolored and their pins corrode within a few years.

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On a Collection of Chilopods from Crete

By RALPH V. CHAMBERLIN

Through the courtesy of Dr. K. Lindberg of Lund, Sweden, I have had the privilege of examining a small collection of chilopods made by him on the island of Crete in April and May, 1955. The specimens were for the most part taken in or near various grottos of that island. The species represented are listed below, three of the lithobiids being described as apparently new.

Cryptops anomalans labyrinthicus Attems

Localities: Grotto Catholico, April 21 (No. 38); Colymbari, on stony slopes, April 24 (No. 39).

Scolopendra canidens cretica Attems

Localities: Grotto of Camillari (near Coubbedès), in entrance, April 1 (No. 27) and April 2 (No. 11); Carteros (Heraclion), hillock near the shore, April 4 (No. 61); Grotto Catholico (Gouverneto), exterior, April 21 (No. 8); Carteros, near Heraclion, stony slopes, April 7 (No. 17); Psychro (Lessithi), under stones, April 7 (No. 76); Sitia, hillock near the shore, April 10 (No. 71); Pyrgos (Milatos), under stones, April 11 (No. 73); Milatos, exterior of the grotto, April 12 (No. 77);

between Marathospila and Psychro, April 15 (No. 50); Grotto Koutrouli, near Gouverneto, exterior, April 22 (No. 15); Colymbari, stony slopes, April 24 (No. 7).

Bothriogaster signata graeca Verhoeff

Localities: Grotto Catholico, exterior, April 21 (No. 13); Carteros (near Heraclion), stony slopes. April 7 (No. 17); Grotto Arkoudas (Gouverneto), exterior, April 21; between Marathospila and Psychro, April 15 (No. 50).

Pachymerium ferrugineum (Koch)

Localities: Lake Kourna, on the shore, April 18 (No. 14); Carteros, near Heraclion, stony slopes, April 7 (No. 17).

Dignathodon microcephalum (Lucas)

Localities: Grotto Koutrouli (Gouverneto), April 22 (No. 43); Grotto Arkoudas, exterior, April 21 (No. 46).

Monotarsobius crassipes (L. Koch)

Localities: Grotto Hagia Triada, April 22 (No. 53); Grotto of Saint Sophia.

Sigibius creticola new species

Ocelli, 1 + 2,3,1. Prosternal teeth, 2 + 2. Articles of antennae, 39–41, much short of attaining the middle of the body.

Ventral spines of first legs, 0,0,0,0,1.

Ventral spines of penult legs, 0,1,3,2,1; dorsal spines, 1,0,3,1,0; claw double. None of the coxae laterally armed.

Claw of female gonopods tripartite; basal spines, 2 + 2.

Length, 12 mm.

Locality: Hellenospila. One female taken April 25, 1955.

Apparently closely related to *S. pusillus* (Latzel) which occurs in southern Austria and has also been previously recorded from Greece. The present form differs from that species in its substantially larger size (120 mm. as against 68 mm.) in the larger number of antennal articles (39 or 41 as against 26–33), in the ventral spining of the penult legs (0,1,3,2,1 instead of 0,1,3,2,0), and in the dorsal spining of those legs (1,0,3,1,0 instead of 1,0,2,1,0 or 0,0,2,1,0).

Lithobius lindbergi new species

Ocelli in three series, 1 + 3,3,2. Prosternal teeth, 4 + 4. Articles of antennae, 45.

Posterior angles of tergites 9,11 and 13 strongly produced.

Dorsal spines of anal legs, 1,3,1,0; ventral spines, 0,1,3,3,1; claws, 2. Ventral spines of penult legs, 0,3,2,2; dorsal spines, 1,0,3,1,1. None of the coxae laterally armed.

Claw of female gonopods entire, slender; basal spines, 2 + 2.

Length, 22 mm.

Locality: Lake Kourna, on the shore. April 18, 1955 (No. 14).

Lithobius sitianus new species

Color chestnut brown, with no longitudinal stripes.

Ocelli, 1 + 3,3,3, those of the two lower series very small. Prosternal teeth, 3 + 4. Antennae long, reaching beyond middle of body; articles, 55–57.

Posterior corners of tergites 9,11 and 13 produced.

Ventral spines of anal legs, 0,1,3,2,1(0); dorsal, 0,0,2,1,0; claws, 2. Ventral spines penult legs, 0,1,3,2(3),1; dorsal, 0,0,2,1,1. Last pairs of coxae laterally armed.

Anal lages long and slender, not specially modified in the male.

Gonopods of female with claw slender and entire; basal spines, 2 + 2.

Length, 19 mm.

Localities: Grotto Megalokatofyngui, May 9, 1955 (No. 70); Grotto of Miletos, May 12 (No. 3); Carteros (near Heraclion), April 7, on stony slopes (No. 17); Grotto of Koutrouli (Gouverneto), entrance, April 22 (No. 37).

Eupolybothrus fasciatus fasciatograecus Verhoeff

Localities: Annex to Grotto Camilari (Coubbedès), April 2 (No. 35); Grotto koutrouli (Gouverneto), April 22 (No. 43).

Scutigera coleoptrata (Linné)

Locality: Columbari, April 24 (No. 39).

Reviews

THE MEGACHILINE BEES OF CALIFORNIA (Hymenoptera: Megachilidae). By Paul D. Hurd, Jr. and Charles D. Michener. Bulletin of the California Insect Survey, Volume 3, pp. 1–247. University of California Press, Berkeley, California, 1955. Price: $3.50.

The authors essayed "to provide usable keys . . . descriptive comments, and detailed data on distribution and floral visits of certain . . . megachiline bees . . . of California." The result is a paper with much new information which will be welcomed by both beginning and veteran bee students. The richness of the megachiline bee fauna is shown by the fact that the 8 genera whose species are given in key form comprise 116 of 154 known North American species. *Osmia*, *Megachile*, and *Coelioxys* are the Californian megachiline genera not treated to the species level. The genera *Formicapis* and *Robertsonella* are reduced to subgenera of *Hoplitis* and many new specific synonymies are made. The discussion of species includes original citation, geographical range, California records, taxonomic and biological notes. The many floral visitational records lend support to the authors' statements that these bees are important in the pollination of the native California flora. A separate index to these records is given—a desirable feature too seldom seen in bee publications. The keys tested are workable and supplemented by 141 line drawings of tergal apices, antennae, etc. A clear-cut, full lateral view of a representative species of each of the 8 genera is given. Distributional maps are included for each species. These maps would have been adequate at much smaller than the half-or full-page size. Further, the bold lettering of the line drawings frequently dwarfs the structure drawn, e.g., nine small mandibular outlines are given an entire 8½ × 11 page. The lateral view of *Chelostoma californicum* showing the principal morphological structures could well have been drawn to show more names of those parts frequently used in the keys. A rigorous effort to make a complete, up-to-date work is evident throughout the paper. The format

is pleasing and the typography is excellent. The drawings themselves are well done. Minor errors are virtually absent but Labitaceae, p. 44, apparently should read Lamiaceae, the alternative name for the Labiatae. The overall excellence of the paper assures it of a place in the library of all serious students of wild bees and others whose interests may touch upon the megachiline bees.—ALVIN F. SHINN.

GREAT EXPERIMENTS IN BIOLOGY. By M. L. Gabriel and S. Fogel. Prentice Hall, Inc., Englewood Cliffs, N. J., 1955. Pp. xiii + 317. Price: Paper back, $3.95.

In this volume the historical development of seven different areas of biology is traced. In each area there is a brief "chronology," followed by extracts from the original accounts (translated when necessary) of discoveries as published by the scientists themselves. Of interest to entomologists, and illustrating the importance of the study of insects as contributing to the development of general biological theory one may call attention, under "Embryology," to the extract from Francesco Redi (A.D. 1688) telling of his experiments that demonstrated that maggots arise from eggs and are not generated spontaneously in meat, pp. 187–89; and to the extracts, under "Genetics," from Sutton (1902) and Wilson (1905) on the chromosome mechanism in insects as related to Mendelian heredity; and finally, under "Evolution," to a condensation of an article by Dobzhansky (1947) on adaptive evolutionary changes actually observable in wild populations of Drosophila flies at the present time.—R. G. SCHMIEDER.

EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale or services rendered. Notices not exceeding three lines free to subscribers.

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and, only when necessary those at the top (being longest in) are discontinued.

Conopidae of the World wanted. Will pay 10¢ to $1.00 for pinned and labelled specimens. S. Camras, 4407 N. Milwaukee Ave., Chicago 30, Illinois.

Anisoptera—Nearctic sp. wanted for exchange, espec. Ophiog., Arigom., Aeschna, Neurocor., Somatoc., Cordulia, Dorocor., Leucor. R. D. Cuyler, Dept. of Entomology, N. C. State College, Raleign, N. C.

Bembicini and Stizini (Hym., Sphec.) of New World wanted for revis. study. Will return upon request or at end of project. James E. Gillaspy, Dept. of Zoology, Univ. Texas, Austin 12, Texas.

Agapema galbina. Will exchange cocoons of this moth for nature books. E. Frizzell, Route 4, Box 96, San Benito, Texas.

Wanted—Data on exact location of colonies of *Epibembex* (olim *Bembix*) (Hymenoptera), any species, any part of country, for biological studies. Howard E. Evans, Dept. Entomology, Cornell Univ., Ithaca, N. Y.

Fanniinae wanted on loan (nearctic and holarctic), and information on collections. James G. Chillcott, Dept. Entom., Univ. of Kansas, Lawrence, Kan. (Loans may be charged to Dr. C. D. Michener.)

Tenebrionidae of the World wanted, in exchange for insects of Argentina and neighboring countries. Horacio J. Molinari, Av. Lib. Gral. San Martin 55, Acassuso (Buenos Aires), Rep. Argentina.

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